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THE FIELD STATUS OF PARASITES OF THE EUROPEAN CORN BORER AT THE CLOSE OF THE 1939 SEASON

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Surveys to determine the current status of parasites of the European corn borer were conducted in the fall of 1939 at a time when the seasonal relationship between the host and parasite had reached equilibrium. The sampling method utilized consisted of collecting a unit number of living borers and borers killed by parasites in the field prior to collection. This unit number was approximately 100, except in certain collections where the adequacy of a smaller number was being tested. The location of the fields from which samples were to be taken was determined in most instances by the use of polar coordinat or transect designs centering at the release point to be examined. The total number of larvae collected in the Lake States and Eastern States areas was 30,384. Summaries of the results of observations in both areas are given in tables 1 and 2.

Table 1.--Parasitization of borers collected in Lake States area in October 1939

State and locality	County	Borers observed	Parasites recovered: Lydella grisescens		Eulophus viridulus		Chelonus annulipes	
		Number	No.	Percent	No.	Percent	No.	Percent
Michigan:								
Columbus Township	St. Clair	523	0	--	0	--	0	--
Erie Township	Monroe	554	86	15.5	3	0.5	0	--
Lake St. Clair Shore	--	867	0	--	0	--	0	--
New York:								
Adams Township	Jefferson	299	0	--	0	--	0	--
Ohio:								
Adams Township	Lucas	308	9	2.9	0	--	13	4.2
Damascus Township	Henry	1,144	0	--	3	0.3	0	--
Evaluation Survey	Lucas	2,907	144	5.0	4	0.1	0	--
Jerusalem Township	do.	3,044	317	10.4	12	0.4	0	--
Lake Erie Shore	--	608	0	--	0	--	0	--
Marion Township	Hancock	538	0	--	0	--	0	--
Perkins Township	Erie	561	213	38.0	1	0.2	0	--
Perry Township	Wood	592	0	--	2	0.3	0	--
Richland Township	Logan	378	0	--	0	--	0	--
Webster Township	Wood	273	0	--	2	0.7	0	--
Total	--	12,596	769	--	27	--	13	--

Table 1.--Parasitization of borers collected in Lake States area in October 1939--Continued

State and locality	County	Parasites recovered: Aplomya caesar		Panzeria penitalis		Labrorychus prismaticus		Undetermined		Total parasitized borers	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Michigan:											
Columbus Township-	St. Clair	3	0.6	1	0.2	0	--	1	0.2	5	1.0
Erie Township-----	Monroe	1	0.2	0	--	0	--	0	--	90	16.2
Lake Saint Clair Shore --		17	2.0	0	--	0	--	2	0.2	19	2.2
New York:											
Adams Township---	Jefferson	2	0.7	0	--	1	0.3	0	--	3	1.0
Ohio:											
Adams Township----	Lucas	2	0.6	1	0.3	0	--	0	--	25	8.1
Damascus Township-	Henry	3	0.3	3	0.3	0	--	0	--	9	0.8
Evaluation Survey-	Lucas	9	0.3	0	--	0	--	2	T	159	5.5
Jerusalem Township	do.	6	0.2	3	0.1	0	--	3	0.1	341	11.2
Lake Erie Shore----	--	6	1.0	2	0.3	0	--	0	--	8	1.3
Marion Township----	Hancock	1	0.2	0	--	0	--	0	--	1	0.2
Perkins Township--	Erie	0	--	0	--	0	--	0	--	214	38.1
Perry Township-----	Wood	0	--	0	--	0	--	0	--	2	0.3
Richland Township-	Logan	2	0.5	0	--	0	--	0	--	2	0.5
Webster Township--	Wood	1	0.3	0	--	0	--	0	--	3	1.1
Total----------	--	53	--	10	--	1	--	8	--	881	--

Table 2.--Parasites recovered in the Eastern States area, fall of 1939, summary

State and locality	County	Parasites recovered																	
		Borers observed		Inareolata punctoria		Lydella grisescens		Macrocentrus gifuensis		Chelonus annulipes		Bassus agilis		Labrorychus prismaticus		Undetermined		Total	
		Number		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Connecticut:																			
E. Hartford Twp.	Hartford	6,317		551	8.7	157	2.5	(1)	-	7	0.1	5	0.7	0	0	3	0.4	723	11.4
Massachusetts:																			
Evaluation Survey	Middlesex	3,135		334	10.6	15	0.5	0	0	0	0	5	0.2	8	0.3	0	0	362	11.6
Taunton area	--	3,973		25	0.6	181	4.6	420	10.6	100	2.8	3	0.1	2	0.1	4	0.1	735	18.5
New Jersey:																			
Atlantic Township	Monmouth	856		19	2.2	29	3.4	0	0	0	0	0	0	0	0	0	0	48	5.6
Brick Township	Ocean	96		0	0	5	5.2	(1)	-	0	0	0	0	0	0	0	0	5	5.2
Burlington Township	Burlington	1,241		2	0.2	19	1.5	1	0.1	8	0.6	0	0	0	0	0	0	30	2.4
Virginia:																			
Franktown Township	Northampton	567		0	0	8	1.4	(1)	-	0	0	0	0	0	0	0	0	8	1.4
Lee Township	Accomac	1,603		0	0	115	7.2	(1)	-	0	0	0	0	0	0	0	0	115	7.2
Total	--	17,788		931	--	529	-	421	-	115	-	13	-	10	-	7	-	2026	--

1/ Species not released at point indicated.

Status of the Parasites as Determined by the 1939 Surveys

Lydella stabulans var. grisescens R. D.--This tachinid was the most abundant of the three species of exotic parasites recorded in the Lake States area in 1939. However, contrary to results of previous years no increase was shown at any point. At Erie Township, Monroe County, Mich., and at Perkins Township, Erie County, Ohio, the percentage of parasitization remained approximately equal to that of 1939, or about 16 and 38 percent, respectively, at the two points. It appears that equilibrium with the host was attained by this parasite in 1938 following releases at Perkins Township, Erie County, Ohio, in 1928 and at Erie Township, Monroe County, Mich., in 1932. The survey in Oregon and Jerusalem Townships in Lucas County, Ohio, conducted to obtain data on the extent to which the parasite dispersed inland from marshland showed that as the distance from the shore increased the percentage of parasitization decreased rapidly. The average parasitization in strips 1 mile wide from the Lake Erie shore line inland is given in the following tabulation.

Strip	Parasitization Percent
1	30.8
2	13.3
3	0.8
4	0.1

The highest percentage of parasitization in any collection was 63.9.

Collections along the Lake Erie shore from the Huron River to Cleveland and near the Lake St. Clair shore from Detroit to St. Clair River showed that L. grisescens was not present in those areas in sufficient numbers to be recovered by the means utilized.

In the Eastern States area L. grisescens was recovered at all points surveyed. From the collections made in Middlesex County, Mass., it was recovered in somewhat larger numbers than in 1938 but was still comparatively scarce there. It continued its increase in the southeastern Massachusetts district and parasitization of the borers observed at the close of 1939 averaged 4.6 percent. It also continued to disperse, adding approximately 325 square miles to its known habitat.

This dipterous parasite was recovered from 9 towns in the vicinity of Hartford, Conn. Its distribution at this point is shown on map 1, where it may be noted that borer parasitization was highest northwest and west of the point of liberation which was at the center of the area represented on the map. This was also the case in 1938. That this westward dispersion is probably significant may be readily shown by an inspection of the parasitization figures. Only 7 collections (19 percent of the 37 collections) made east of the release point produced L. grisescens. In all of these the rate of parasitization by this fly was very low and all but 1 of the 7 were located within 2 1/2 miles of the release point. Of the 34 collections made west of the release point, 26 (76 percent) gave L. grisescens and the prasitization was comparatively high, especially

in the territory southwest of the city of Hartford.

L. grisescens was found to be well established at Atlantic, Monmouth County, and Brick, Ocean County, N. J. At the Burlington, N. J., parasite release point it was found to be well established and spreading rapidly from the point where a small number of the adults were first released in 1939.

In Virginia, L. grisescens had not increased in 1939 but continued to be the only exotic parasite of the borer present in that region. The average parasitization by this parasite was 7.2 percent at Lee Township, Accomac County, and 1.4 percent at Franktown Township, Northampton County, both locations on the Eastern Shore.

Eulophus viridulus Thoms.:--This ectophagous chalcid, which was recovered in 1938 in the Lake States for the first time in the United States, was taken at several new points in 1939. A number of these points had been examined primarily to determine the extent to which E. viridulus had become established and the current examination constituted the first observations that had been made for several years. Therefore, at such points it is not definitely known in what year the parasite reached a density measurable by the means utilized. At one point, however, Perkins Township, Erie County, Ohio, at which the parasite had been released in 1931 and 1932, examinations have been made annually but no recoveries had been made prior to 1939. It is evident, therefore, that E. viridulus remained on a maintenance basis for a number of years at such low concentrations that it was not recovered by the means utilized. An examination of eight of the points in the Lake States area at which this parasite had been released showed it to be established at six. Further evidence that the parasite had extended its range without greatly increasing in density at any point, is furnished by miscellaneous recoveries in the summer of 1939. During surveys to determine the field status of the corn borer, a colony was taken at Swanton, Ohio, about 20 miles southwest of the nearest release point, and another in Wyandotte County, about 19 miles southeast of the nearest release point at Marion Township, Hancock County, Ohio. E. viridulus was not recovered at any of the points in the eastern area.

Inareolata punctoria Roman.:--This ichneumonid accounted for more mortality of borers at the points surveyed in the eastern area than any other parasite. It was reared from 35 of the 36 collections taken in Middlesex County, Mass., and showed an average parasitization of 10.6 percent with 23.9 percent of the borers in 1 collection being parasitized.

At the Hartford, Conn., survey district, parasitization of the borer by I. punctoria averaged 14.1 percent in the territory within 1 1/2 miles of the release point. From this central portion to the perimeter of the survey, parasitization of the borer by this ichneumonid gradually decreased and in the outer ring, 1 mile wide and 6 1/2 miles from the release point, parasitization was only 4.1 percent. In general, the rate of parasitization decreased as the distance from the point of release increased. However, I. punctoria was reared from all but three of the collections made in the outer portion of the surveyed area and this fact plus the parasitization (4.1 percent) at the outer limits of the surveyed territory indicates that this parasite is present beyond the limits of its distribution as shown on map 2.

I. punctoria was found to be well established at the more recent liberation point at Atlantic, N. J., where parasitization by it had reached 2.2 percent. Initial establishment and maintenance were shown at the Burlington, N.J. parasite-colonization point, where it was released in 1938. This parasite was not recovered on the Eastern Shore of Virginia nor at any point in the Lake States area.

Macrocentrus gifuensis Ashm.--In the 1939 survey M. gifuensis was found to be present in quantity only in southeastern New England, but the data from this area indicated that this polyembryonic ichneumonid was the most abundant parasite acting on the borer. It averaged 10.6-percent parasitization of all borers observed at the close of 1939 in the southeastern New England area, as compared to an 8.0-percent average at the close of 1938. One collection showe a parasitization of 52.4 percent and 17 additional collections each averaged parasitization of the borers of 20 percent or higher by this introduced parasite. It was reared from 61, or 68.5 percent, of the sample collections made the above-mentioned area in 1939, as compared to only 49 percent of those obtained at the close of 1938. M. gifuensis continued to disperse and occupied new territory toward the east and south but no evidence was obtained to indica further dispersion westward.

Chelonus annulipes Wesn.--This braconid was recovered at the point in Adams Township, Lucas County, Ohio, where it had become initially established in 193 and where it had been liberated to determine its reaction to the tendency of the borer to produce two generations per year in that locality. The survey showed that the parasite had increased over 280 percent in abundance. In one the collections parasitization by this species was 12.6 percent.

This egg-larval parasite was released in numerous locations in the Connec cut River Valley in the spring of 1939 and six of these releases were made wit in the territory surveyed in the fall of 1939. Parasite field-status collections were made at random without regard to Chelonus annulipes liberation poin yet this parasite was recovered from five widely scattered collections. Such general initial establishment had been anticipated, as the releases were well synchronized with the presence of host eggs, a condition which, it is known, usually promotes recovery during the season of release.

Native species--Four species of native parasites, Bassus agilis Cresson, Labrorychus prismaticus Norton, Aplomya caesar Ald., and Panzeria penitalis Coq., were recovered in 1939. Their combined parasitization was unimportant.

Summary

In the Lake States area the only parasitization of the borer of possible economic importance at the close of the 1939 season was confined to areas adjacent to marshland in the vicinity of southwestern Lake Erie and was produced by a single species of parasite, the exotic tachinid Lydella stabulans var. grisescens.

The ectophagous chalcid parasite, Eulophus viridulus, was found to be wid spread throughout several counties near Toledo, Ohio, but concentrations were low at all points.

Chelonus annulipes was recovered at only one point in the Lake States area.

In the Eastern States area, complexes of several parasites were found at a number of points. In Middlesex County, Mass., Inareolata punctoria, Lydella grisescens, and native parasites were responsible for a parasitization of 11.6 percent, with I. punctoria the predominant species. In southeastern New Engla a parasitization of 18.5 percent was observed. The polyembryonic braconid Macrocentrus gifuensis was the chief parasite in this area, with L. grisescens I. punctoria, and native species being present, their abundance being in the order given.

At Hartford, Conn., Inareolata punctoria, Lydella grisescens, Chelonus annulipes, and native parasites were recovered. Here I. punctoria was the mos abundant species, with L. grisescens second in importance.

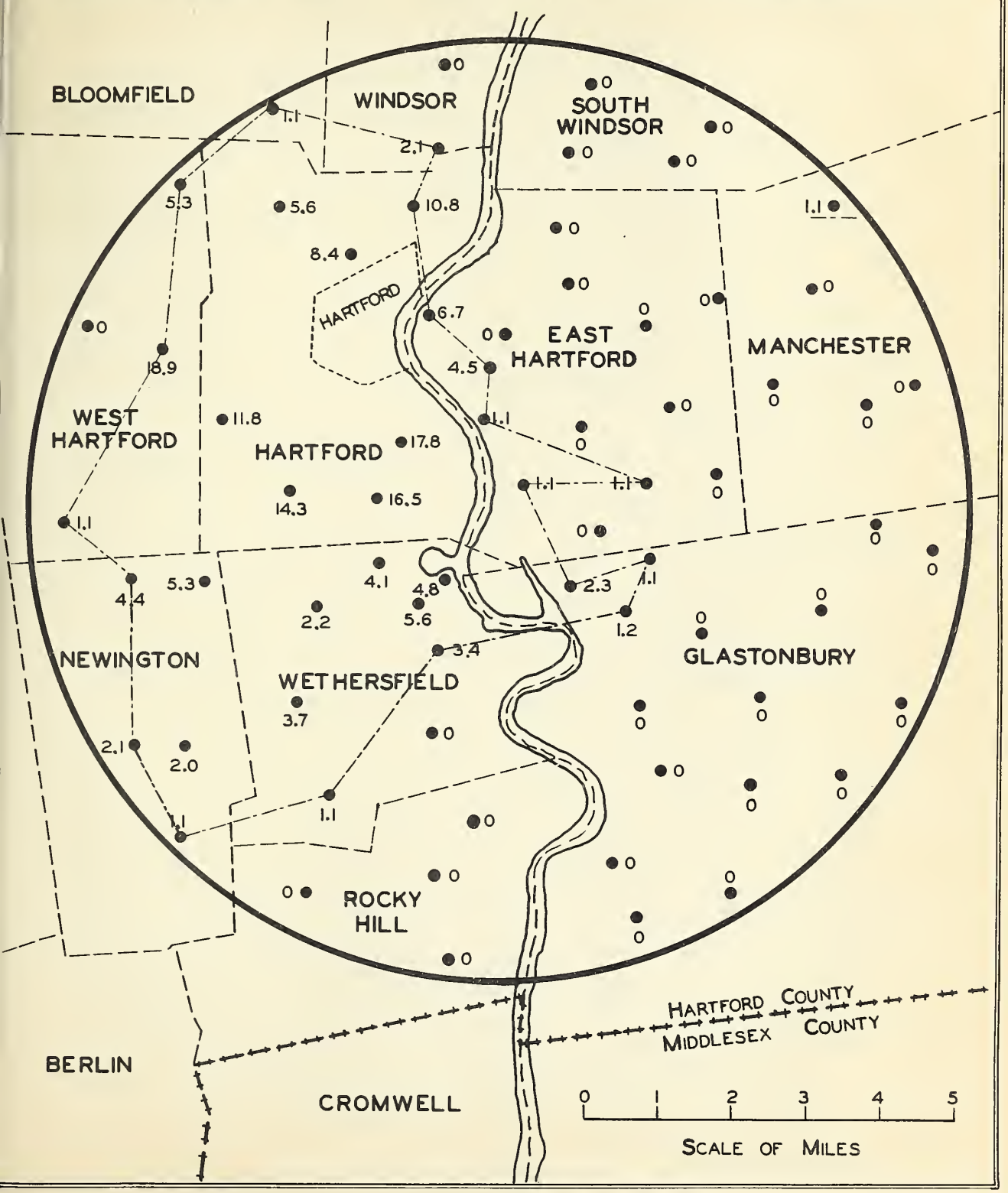
At Burlington, N. J., four species of exotic parasites were recovered but none were abundant at this recently established release point.

Inareolata punctoria and Lydella grisescens were recovered in small numbe at several other points in the Eastern States area.

MAP 1.

TERRITORY COVERED IN THE EUROPEAN CORN-BORER PARASITE FIELD STATUS SURVEY IN THE HARTFORD, CONN. DISTRICT, FALL OF 1939.

SURVEY LIMITS —— ● COLLECTION POINTS
FIGURES INDICATE PERCENT PARASITIZATION BY L. GRISESCENS R.&D.



MAP 2.

TERRITORY COVERED IN THE EUROPEAN CORN-BORER PARASITE FIELD STATUS SURVEY IN THE HARTFORD, CONN. DISTRICT, FALL OF 1939.

SURVEY LIMITS ——— ● COLLECTION POINTS

FIGURES INDICATE PERCENT PARASITIZATION BY I. PUNCTORIA ROMAN.